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"Modern Corn-Milling."

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THE mechanism of corn-mills is just now undergoing a great and radical transformation. The old millstones, which served men for twenty centuries, will soon be banished from mills. New apparatus and new processes have been devised, and their construction is such that they will henceforward recommend themselves to every one. Nowadays, indeed, no one doubts that the process of high grinding, so well explained in the Papers[1] which recently appeared in the Minutes of Proceedings, represents real and useful progress; nor does any one doubt that roller-mills will prove, in all respects, better than stone-mills. It may be an open question whether it would not be better to adopt the new methods partially, rather than in their entirety; but it cannot but be admitted that they possess very great merits and advantages, and have been well thought out. The expediency of complicating the arrangements of the mills in order to obtain a constantly improving quality of flour, when the refinement of the public taste does not as yet demand it, may be called in question; the necessity, from an economical point of view, of producing an extensive series of flours of different degrees of colour, purity, and nourishing power, may be doubted, on account of the risk of the finer qualities being too expensive, the coarser too dark and unsaleable. An apt hand and sound judgment are required for the selection of the process best adapted to ever-changing local requirements, so as not to run the risk of compromising a business for the sake of theoretical perfection, but it is certain that more or less complicated high-grinding constitutes the best means yet invented of removing the flour from the grain, and that which yields the highest return in quantity and quality. It is certain that the force of the stones, which entirely and at once crushes the grains of corn, ought to be superseded by the process of repeated passages between grooved

[1] Minutes of Proceedings Inst. C.E., vol. lxx., pp. 162 *et seq.*

rollers, which gradually opens and breaks them in pieces, and frees them from impurities. Then the work of the grinding rollers, which are either finely cut, or made of porcelain with a naturally rough surface, divests the coarse bran of those valuable particles which it still contains, a work which the millstone is unfitted to accomplish.

This preparatory process of breaking the grain and removing the residuum of semolina, has the effect of producing, besides the bran, two or three qualities of flour of inferior grade, which are rich in starch and dirty, and the production of which in the passage between the rollers cannot be prevented, and, which is of more importance, yields an assortment of middlings and semolinas which, after being conveniently assorted, are converted into flour between smooth rollers of chilled iron or porcelain, or else between stones. This last use of stones should not be forgotten, for it supplies a means of utilising the old material of a mill in course of transformation, without in any way detracting from the value of the new methods.

Some persons object that the high-grinding systems are far from possessing that simplification of labour which was claimed for them on their first introduction, and which, in truth, they have not attained; and they add that however simple an arrangement of grinding is adopted, with few (three or four) breaks, few (two) cleaning operations, and few operations of actual grinding, a series of different products will be obtained from the best flour, beautifully white and of golden brilliancy, down to the last and darkest coloured flours. These products, varying so much in character, cannot obtain purchasers who will give the prices required, and they conclude that the conversion of an old mill is often premature. The Author considers that this reasoning is erroneous, for if it is certain that high-grinding gives a greater return in flour; if it is certain that each of the various qualities obtained is specifically purer and more uniform than those which are produced by low grinding, why should not the different qualities obtained be carefully mixed together? Why should not the five, six or eight kinds obtained, be successfully reduced to two, three, or whatever number has been habitually used in the past? The kinds formerly used will still be obtained, with the advantage that they will undoubtedly be better than formerly, in consequence of the perfect manipulation which the flour has undergone.

Is it not a fact that the benefit of the larger yield of the grain in quantity, and the more satisfactory results in regard to quality, are always obtained? Is it not, then, a fact, that such advantages

are independent of the number of kinds produced when the effective methods of mixing them are thoroughly understood? It would certainly seem so. It is certain that the necessary expenditure of new arrangements, when compared with the advantages in working, can never be a serious argument against the adoption of new methods and apparatus.

If, leaving for the present the essential parts of the modern revolution in corn-mills, attention is paid to the improvements necessarily introduced into the machines intended to effect it, and especially to the roller-mills, it will be seen that the perfection which has been attained in the last few years is in the highest degree satisfactory.

Roller-mills, like all other machines, have their history of exaggerated hopes and exaggerated disappointments. Originated in about the year 1830, they were successively abandoned and taken up again, by their constructors, up to about 1870. Their success dates from this latter period. The firm of Ganz, of Budapest, have been the foremost in working to obtain this success, with their spirally grooved cylinders of chilled iron, intended for breaking up the grain, and their smooth cylinders, also of chilled iron, for grinding; next Wegmann, of Zurich, with his porcelain cylinders for stripping and grinding middlings, at which, for the last twenty years, he has worked with exemplary perseverance and ever-increasing success; and many other inventors.

The doubts which five or six years ago disturbed the minds of millers and machinists are disappearing. The obscurity which surrounded their judgment in regard to the selection of the right diameters for the cylinders and the method of grooving them, as well as their relative velocities, is fading away. It is now definitely settled that the diameter should not be very large (not more than about 1 foot 6 inches), as otherwise the advantage which rollers possess over stones in shortening the passage of the corn between the grinding surfaces would be lost. It is settled that such diameter should be chosen as will give the highest output without an excessive duration of contact between the grain and the surfaces of the cylinders. It is a settled principle to cause the two rollers, of a pair, to revolve with different circumferential velocities, either by having equal diameters and different rates of revolution, or by equal rates of revolution and different diameters, varying from the ratio of 1 to 1·5 for the first pair, up to 1 to 4 for the last; and it is also settled that the grooving should increase in fineness from the first to the last pair as the dressing of the coarse middlings proceeds.

From the first of these principles it follows that one of the cylinders, the one which has the slower motion, acts as feeder to the other, which runs at a higher speed. From the second is derived the necessity of using rollers with finer and finer grooves as the fragments derived from the successive breakings get smaller, till the middlings are reached, which can be dressed with rollers of 9-inches diameter, carrying from nine hundred to one thousand grooves, or even with porcelain rollers, whose natural roughness takes the place of the grooves.

Finally, it is placed beyond doubt that the grinding, of the semolina (*gries*) and of the middlings (*dunst*) previously cleaned, can be conveniently effected either by stones or by Wegmann's machines with porcelain cylinders, or with rollers of smooth chilled iron. And it is no little result to have determined so many doubtful points, and to have set out on this high road of which in the past there was not even a trace, insomuch as only to-day can corn-grinding aspire to take its place among the industries which are nearest perfection, and to a certain extent complete.

The Author does not consider it necessary to say anything about the other apparatus connected with milling. Centrifugal sifting-machines have been well received on account of the small space they occupy and their great efficiency; and still more popular are those machines for cleaning the bran, which satisfy the two conditions of extreme simplicity of construction and efficiency in production. It is only needful to state that these results have been achieved.

In Italy the principal millers have begun to rouse themselves, and were it not for the tax upon grinding, which, with its intricate fiscal laws, is fatal to any kind of progress, a further advance would certainly have been made than obtains at present. On all sides the necessity of welcoming new methods is becoming imperative, and it is to be expected that the abolition of the above mentioned tax with the year 1883 will give an open field for boldly renewing all old-fashioned plant. Millers of the middle and lower ranks see their flour discredited, and daily find themselves face to face with buyers who give the preference to flour from roller-mills, and the same classes of flour already fetch two different prices according as they are produced from low or high grinding. On the other hand, the taste of the public is rapidly learning to appreciate improved products, and before many years have passed Italy too will have attained a satisfactory position in regard to the industry of corn-milling.